UNITED STATES ENVIRONMENTAL PROTECTION AGENCY WASHINGTON, DC 20460

OFFICE OF CHEMICAL SAFETY
AND POLLUTION
PREVENTION

March 07, 2018
Revised April 17, 2018

MEMORANDUM

Subject: Efficacy Review for SilvaClean, EPA Reg. No. 90335-1; DP Barcode: D444670; Submission #: 1012169; E-Sub # 24426.

From: Kristen Willis, Ph.D.
Efficacy Team Leader
Product Science Branch
Antimicrobials Division (7510P)

Kristen Willis

To: Zeno Bain, PM33 / Aline Heffernan
Regulatory Management Branch I
Antimicrobials Division (7510P)

Applicant: Applied Silver, Inc.
26254 Eden Landing Road
Hayward, CA 94545

Formulation from the Label:

Active Ingredients	% by wt.
Silver	22.5 %
Other Ingredients:	77.5 %
Total	100.0 %

I. BACKGROUND

Product Description (as packaged, as applied): Liquid concentrate

Submission type: Label amendment

Currently registered efficacy claim(s): application to textiles after each laundering to protect fibers against stain- and odor-causing bacteria, mold, and mildew.

Requested action(s): Add residual self-sanitizing laundry additive claim

Documents considered in this review:

- Letter from applicant to EPA dated November 17, 2017
- Application for Pesticide (EPA form 8570-1) dated November 17, 2017
- Certification with Respect to Citation of 1ata (EPA Form 8570-34) dated November 17, 2017
- Data Matrix (EPA Form 8570-35) dated November 17, 2017
- 7 efficacy studies (MRID 504405-01-504405-08)
- 1 additional MRID dated 01/23/2018 with supplemental information to address the technical screen (MRID 50504501)
- Proposed label dated November 17, 2017

II. PROPOSED DIRECTIONS FOR USE

For ongoing residual self-sanitizing activity against *Klebsiella pneumoniae*, and *Staphylococcus aureus*, on cotton, cotton/polyester blends, and microfiber fabrics and for preservation against stain- and odor causing bacteria, mold and mildew use as directed.

SilvaClean® is a concentrate that must be diluted with distilled or deionized water before use.

Ongoing residual self-sanitizing: Dilute the following volumes of SilvaClean® concentrate volumes per 100 lbs of selected fabric type into 500 or 1000 mL distilled or deionized water and dose as part of the final rinse step in the laundry process to achieve residual self-sanitization:

- 0.024 oz per 100 lbs cotton
- 0.032 oz per 100 lbs cotton/poly blend
- 0.048 oz per 100 lbs microfiber

Add the diluted solution into the final rinse cycle of a laundry process. Allow to soak with fabric at least 2 minutes.

III. STUDY SUMMARIES

1. MRID 504405-02 "Treating Fabric with Self-Sanitizing Laundry Test Solution" for Test Solution, by Sean Elizabeth Richard. Study conducted at Microchem Laboratory. Study completion date – 14 NOV 2017. Laboratory Project Number GLP1777.

This study was conducted to treat three fabric types, Microfiber (100% Polyester, lot: 286-E), Cotton (100%, lot: 286-A), and Cotton/Poly Blend (55% Cotton, 45% Polyester, lot: 286-B), with "Test Solution" (lots: 170821-1, 170821-2, and 170821-3) during laundry, according to Microchem Laboratory protocol P1937 (copy provided). The product, adjusted to the LCL concentration, was diluted to 0.0000310 ration in 200ppm hard tap

water for polyester, 0.0000155 for cotton, and 0.0000207 for blend. Product was applied during 23-minute rinse cycle with 2-minute soaking time; and 55-minute drying time.
Treated fabrics were assigned the following lot numbers:

Treated Microfiber Fabric: M-1-11SEP2017A, M-2-11SEP2017A, and M-3-11SEP2017A
Treated Cotton Fabric: C-1-12SEP2017A, C-2-12SEP2017A, and C-3-12SEP2017A
Treated Cotton/Poly Blend Fabric: CP-1-12SEP2017A, CP-2-12SEP2017A, and CP-3-12SEP2017A

2. MRID 504405-03 "Evaluating Self-Sanitizing Fabric using the AATCC 100 Method against S. aureus", by Elizabeth Richard. Study conducted at Microchem Laboratory. Study completion date – 14 NOV 2017. Laboratory Project Number GLP1810.

This study was conducted against *Staphylococcus aureus* (ATCC 6538). Three lots (C-1-12SEP2017A, C-2-12SEP2017A, and C-3-12SEP2017A) of "Treated Cotton Fabric", were tested according to Microchem Protocol P1938 (copy provided). Three carriers per lot per contact time were inoculated with 1 ml of microorganism culture, wrapped and incubated at 36±1°C for 30 min, 1 hour, 2 hours, 3 hours, 6 hours, and 24 hours. Upon completion of the contact time, carriers were harvested into twenty (20) ml of neutralizing broth (Dey Engley (D/E) broth). All tubes containing test or control fabric were vortex mixed for 2 minutes ± 5 seconds. Neutralizing broth was enumerated using standard pour plating techniques. All plates for test and control fabrics were incubated for 48 ± 4 hours and all study controls were incubated for 48 ± 2 hours at 36±1°C.

3. MRID 504405-04 "Evaluating Self-Sanitizing Fabric using the AATCC 100 Method against S. aureus", by Elizabeth Richard. Study conducted at Microchem Laboratory. Study completion date – 14 NOV 2017. Laboratory Project Number GLP1813.

This study was conducted against *Staphylococcus aureus* (ATCC 6538). Three lots (CP-1-12SEP2017A, CP-2-12SEP2017A, and CP-3-12SEP2017A) of "Treated Cotton/Poly Blend Fabric", were tested according to Microchem Protocol PP1994 (copy provided). Three carriers per lot per contact time were inoculated with 1 ml of microorganism culture, wrapped and incubated at 36±1°C for 30 min, 1 hour, 2 hours, 3 hours, 6 hours, 24 hours, 48 hours, and 72 hours. Upon completion of the contact time, carriers were harvested into twenty (20) ml of neutralizing broth (Dey Engley (D/E) broth). All tubes containing test or control fabric were vortex mixed for 2 minutes ± 5 seconds. Neutralizing broth was enumerated using standard pour plating techniques. All plates for test and control fabrics were incubated for 48 ± 4 hours and all study controls were incubated for 48 ± 2 hours at 36±1°C.

4. MRID 504405-05 "Evaluating Self-Sanitizing Fabric using the AATCC 100 Method against S. aureus", by Elizabeth Richard. Study conducted at Microchem Laboratory. Study completion date – 14 NOV 2017. Laboratory Project Number GLP1814.

This study was conducted against *Staphylococcus aureus* (ATCC 6538). Three lots (M-1-11SEP2017A, M-2-11SEP2017A, and M-3-11SEP2017A) of "Treated Microfiber Fabric", were tested according to Microchem Protocol P2005 (copy provided). Three carriers per lot per contact time were inoculated with 1 ml of microorganism culture, wrapped and incubated at 36±1°C for 30 min, 1 hour, 2 hours, 3 hours, 6 hours, and 24 hours. Upon completion of the contact time, carriers were harvested into twenty (20) ml of neutralizing broth (Dey Engley (D/E) broth). All tubes containing test or control fabric were vortex mixed for 2 minutes ± 5 seconds. Neutralizing broth was enumerated using standard pour plating techniques. All plates for test and control fabrics were incubated for 48 ± 4 hours and all study controls were incubated for 48 ± 2 hours at 36±1°C.

5. MRID 504405-06 "Evaluating Self-Sanitizing Fabric using the AATCC 100 Method against K. pneumoniae", by Elizabeth Richard. Study conducted at Microchem Laboratory. Study completion date – 14 NOV 2017. Laboratory Project Number GLP1811.

This study was conducted against *Klebsiella pneumoniae* (ATCC 4352). Three lots (C-1-12SEP2017A, C-2-12SEP2017A, and C-3-12SEP2017A) of "Treated Cotton Fabric", were tested according to Microchem Protocol P1979 (copy provided). Three carriers per lot per contact time were inoculated with 1 ml of microorganism culture, wrapped and incubated at 36±1°C for 30 min, 1 hour, 2 hours, 3 hours, 6 hours, and 24

hours. Upon completion of the contact time, carriers were harvested into twenty (20) ml of neutralizing broth (Dey Engley (D/E) broth). All tubes containing test or control fabric were vortex mixed for 2 minutes ± 5 seconds. Neutralizing broth was enumerated using standard pour plating techniques. All plates for test and control fabrics were incubated for 48 ± 4 hours and all study controls were incubated for 48 ± 2 hours at 36±1°C.

6. MRID 504405-07 "Evaluating Self-Sanitizing Fabric using the AATCC 100 Method against K. pneumoniae", by Elizabeth Richard. Study conducted at Microchem Laboratory. Study completion date – 14 NOV 2017. Laboratory Project Number GLP1812.

This study was conducted against *Klebsiella pneumoniae* (ATCC 4352). Three lots (CP-1-12SEP2017A, CP-2-12SEP2017A, and CP-3-12SEP2017A) of "Treated Cotton/Poly Blend Fabric", were tested according to Microchem Protocol PP1993 (copy provided). Three carriers per lot per contact time were inoculated with 1 ml of microorganism culture, wrapped and incubated at 36±1°C for 30 min, 1 hour, 2 hours, 3 hours, 6 hours, 24 hours, 48 hours, and 72 hours. Upon completion of the contact time, carriers were harvested into twenty (20) ml of neutralizing broth (Dey Engley (D/E) broth). All tubes containing test or control fabric were vortex mixed for 2 minutes ± 5 seconds. Neutralizing broth was enumerated using standard pour plating techniques. All plates for test and control fabrics were incubated for 48 ± 4 hours and all study controls were incubated for 48 ± 2 hours at 36±1°C.

7. MRID 504405-08 "Evaluating Self-Sanitizing Fabric using the AATCC 100 Method against K. pneumoniae", by Elizabeth Richard. Study conducted at Microchem Laboratory. Study completion date – 14 NOV 2017. Laboratory Project Number GLP1815.

This study was conducted against *Klebsiella pneumoniae* (ATCC 4352). Three lots (M-1-11SEP2017A, M-2-11SEP2017A, and M-3-11SEP2017A) of "Treated Microfiber Fabric", were tested according to Microchem Protocol P2006 (copy provided). Three carriers per lot per contact time were inoculated with 1 ml of microorganism culture, wrapped and incubated at 36±1°C for 30 min, 1 hour, 2 hours, 3 hours, 6 hours, and 24 hours. Upon completion of the contact time, carriers were harvested into twenty (20) ml of neutralizing broth (Dey Engley (D/E) broth). All tubes containing test or control fabric were vortex mixed for 2 minutes ± 5 seconds. Neutralizing broth was enumerated using standard pour plating techniques. All plates for test and control fabrics were incubated for 48 ± 4 hours and all study controls were incubated for 48 ± 2 hours at 36±1°C.

V. RESULTS

MRID	Organism	Lot #	Controls	% Reduction							
				30 min.	1 hr.	2 hrs.	3 hrs.	6 hrs.	24 hrs.	48 hrs.	72 hrs.
Treated Cotton Fabrics											
504405-03	*Staphylococcus aureus* (ATCC 6538)	C-1-12SEP2017A	3.6×10^5 1.03×10^6	56.09	89.43	98.22	99.86	>99.99	>99.99	-	-
		C-2-12SEP2017A		65.90	75.99	99.16	99.54	>99.9	>99.99	-	-
		C-3-12SEP2017A		57.66	90.60	98.49	>99.9	>99.9	>99.99	-	-
504405-06	*Klebsiella pneumoniae* (ATCC 4352)	C-1-12SEP2017A	5.25×10^5 1.09×10^6	32.56	38.61	99.77	>99.99	>99.9999	>99.99999	-	-
		C-2-12SEP2017A		32.09	69.24	99.68	>99.99	>99.999	>99.99999	-	-
		C-3-12SEP2017A		0	45.32	99.68	>99.99	>99.999	>99.99999	-	-
Treated Microfiber Fabrics											
504405-05		M-1-11SEP2017A	4.5×10^5	61.36	95.83	99.70	>99.9	>99.9	-	-	-

MRID	Organism	Lot #	Controls	% Reduction							
				30 min.	1 hr.	2 hrs.	3 hrs.	6 hrs.	24 hrs.	48 hrs.	72 hrs.
	Staphylococcus aureus (ATCC 6538)	M-2-11SEP2017A	4.33×10^5	41.59	97.45	99.56	99.51	>99.9	-	-	-
		M-3-11SEP2017A		72.04	91.79	99.49	>99.9	>99.9	-	-	-
504405-08	*Klebsiella pneumoniae* (ATCC 4352)	M-1-11SEP2017A	3.58×10^5	24.70	98.14	>99.9	>99.99	>99.999	>99.9999	-	-
		M-2-11SEP2017A	1.79×10^5	54.65	97.23	>99.9	>99.99	>99.999	>99.9999	-	-
		M-3-11SEP2017A		86.04	99.77	>99.9	>99.99	>99.999	>99.9999	-	-
Treated Cotton/Poly Blend Fabrics											
504405-04	*Staphylococcus aureus* (ATCC 6538)	CP-1-12SEP2017A	5.89×10^5	46.29	65.06	95.07	99.03	>99.99	>99.999	>99.9999	>99.9999
		CP-2-12SEP2017A	6.71×10^5	53.33	98.44	99.87	99.18	>99.99	>99.999	>99.9999	>99.9999
		CP-3-12SEP2017A		35.05	70.17	99.82	99.55	99.99	>99.999	>99.9999	>99.9999
504405-07	*Klebsiella pneumoniae* (ATCC 4352)	CP-1-12SEP2017A	1.57×10^6	40.10	66.92	99.88	>99.999	>99.9999	>99.9999	>99.99999	>99.999999
		CP-2-12SEP2017A	1.04×10^6	37.87	96.39	>99.99	>99.9999	>99.9999	>99.9999	>99.99999	>99.999999
		CP-3-12SEP2017A		50.25	92.48	>99.9	>99.9999	>99.9999	>99.9999	>99.99999	>99.999999

VI. CONCLUSIONS

MRID #	Claim	Surface Type	Application Method(s) and Dilution	Contact Time	Soil load	Diluent	Organism(s)	Data support label claims?
504405-02 - 504405-08	Residual Bacterial Reduction for Post Laundry Contaminations	Laundered Dried Fabrics/Textiles	0.0000310 ration for polyester, 0.0000155 for cotton, and 0.0000207 for blend.	23-minute rinse cycle with 2-minute soaking time; and 55-minute drying time	No	200ppm hard tap water	• *Staphylococcus aureus* (ATCC 6538) • *Klebsiella pneumoniae* (ATCC 4352)	No

VII. LABEL

Proposed Label dated November 17, 2017

1. The proposed label claims that the product, SilvaClean (EPA Reg. No. 90335-1), provides ongoing residual self-sanitizing activity against *Staphylococcus aureus* and *Klebsiella pneumoniae* on cotton, cotton/polyester blend and microfiber materials until the next laundering event. **These claims are not acceptable as they are not supported by the submitted data**.

All claims for residual self-sanitizing activity should be removed. The following provide rationale as to why these claims are not acceptable:

- To make label claims as a "Sanitizer" a product should demonstrate a 3-log reduction at a contact time ≤5 minutes.
    - A 3-log reduction was not achieved for any of the fabric types at a 30-minute contact time
- Claims for "ongoing" are synonymous with continuous and testing to support these claims should include re-inoculation steps.

2. The applicant must make the following changes to the proposed label, as appropriate:

- Remove all claims and associated directions for use as a "residual self-sanitizer"
- Remove all claims for "self-sanitizing" and any mention of specific microorganisms (e.g. *Staphylococcus aereus* and *Klebsiella pneumoniae*).
- Remove the optional marketing claims for healthcare and sports

The registrant submitted a revised label on 04/12/2018 after a meeting with EPA that same day. In attendance at the meeting for EPA were the following individuals: Anita Pease, Steve Weiss, Emily Mitchell, Kay Montague, Zeno Bain and Kristen Willis.

Proposed Label dated April 12, 2017

1) On pages 1-3 and 5 of the proposed label, remove claims for "residual bacterial reduction." At this time, we are not considering bacterial reduction claims public health organisms. As an alternative, the following claim or variation on this claim would be acceptable: "Post-laundry additive with residual activity against *S. aureus* after 6 hours of contact and *K. pneumoniae* after 3 hours of contact"

2) On page 1 of the proposed label, revise the contact time for *Klebsiella pneumoniae* to 3 hours. A 3-log reduction was not achieved on the cotton and poly-cotton blend fabrics until 3 hours.

3) On page 2 of the proposed label, the directions for use should indicate that post-laundry residual activity against *S. aureus* and *K. pneumoniae* is applicable to properly/adequately stored, unused laundered fabrics/textiles. In addition, the directions for use section should include the contact times for the tested microorganisms.

4) Please include the ATCC numbers for the tested microorganisms (*K. pneumoniae* ATCC 4352 and *S. aureus* 6538) somewhere on the label. This may be down in text or by using a table format.

5) On pages 4 and 5, the optional marketing claims, please revise to read as follows:

    a. Healthcare: As part of a diligent infection control program, experts recommend that a hospital should seek to reduce or eliminate exposure to pathogens to the greatest extent practical. One practical, inexpensive way to aid in this effort is to use *SilvaClean*® laundry additive. It provides residual post-laundry activity against *S. aureus* after 6 hours of contact and *K. pneumoniae* after 3 hours of contact when textiles such as bed linens and patient gowns are laundered through the SilvaClean program and properly stored. SilvaClean may be a helpful addition to an Infection Control program. SilvaClean is not a substitute for any existing component of a diligent Infection Control program. Practitioners should continue to implement fully all infection control measures.

    b. Sports: As part of a diligent sports medicine infection control program, experts recommend that athletic programs should seek to reduce or eliminate exposure to pathogens to the greatest extent practical. One practical, inexpensive way to aid in this effort is to use *SilvaClean*® laundry additive. It provides residual post-laundry activity against S. aureus after 6 hours of contact and K. pneumoniae after 3 hours of contact when textiles such as bed linens and patient gowns are

laundered through the SilvaClean program and properly stored. SilvaClean may be a helpful addition to an Infection Control program. SilvaClean is not a substitute for any existing component of a diligent Infection Control program. Practitioners should continue to implement fully all infection control measures.